Integrated Information System for Multi-criteria Management of Orthopedic Infections

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Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

Integrated Information System for Multi-criteria Management of Orthopedic Infections

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Motivating Context

Orthopedic Infections Diagnosis

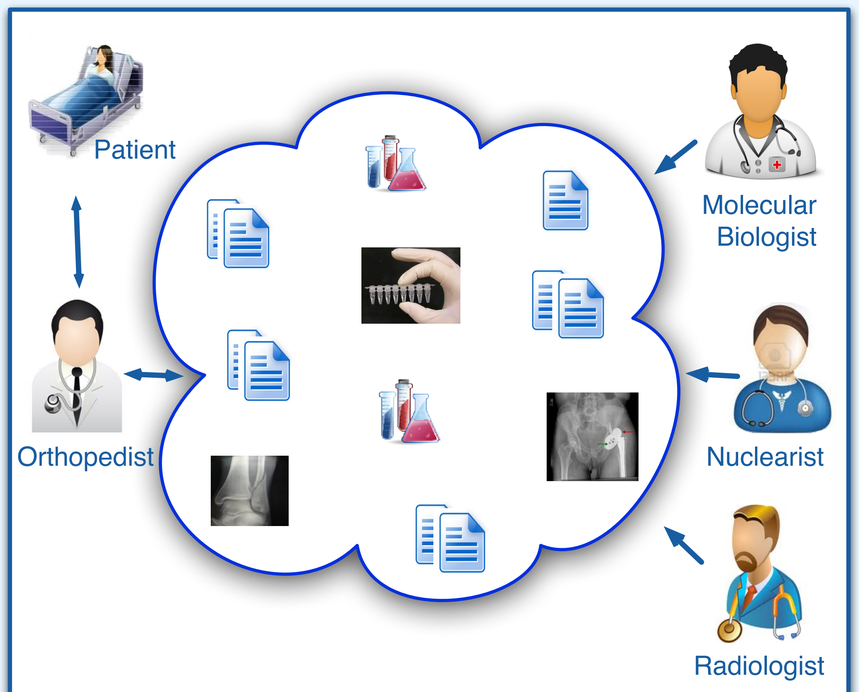
- **Complex**
  - Many infections lasting several months
  - Unadapted Antibiotherapy : Multi-resistant Bacteria
  - Septic vs Aseptic (chronic infections)

  => Pluridisciplinary approach
    - Imaging
    - Patient History
    - Aspirates/Biopsies

  } - Few/no integration - Local guidelines

- **Long and Tedious**
  - Bacteria Identification (conventional culture methods)
    - Slow growth : from two day to two weeks
    - Living bacteria create risks of contamination
    - Many False negatives
  - Slow Evolution (several months)

- **Expensive**
  - Repeated Hospitalizations
  - Repeated Imaging

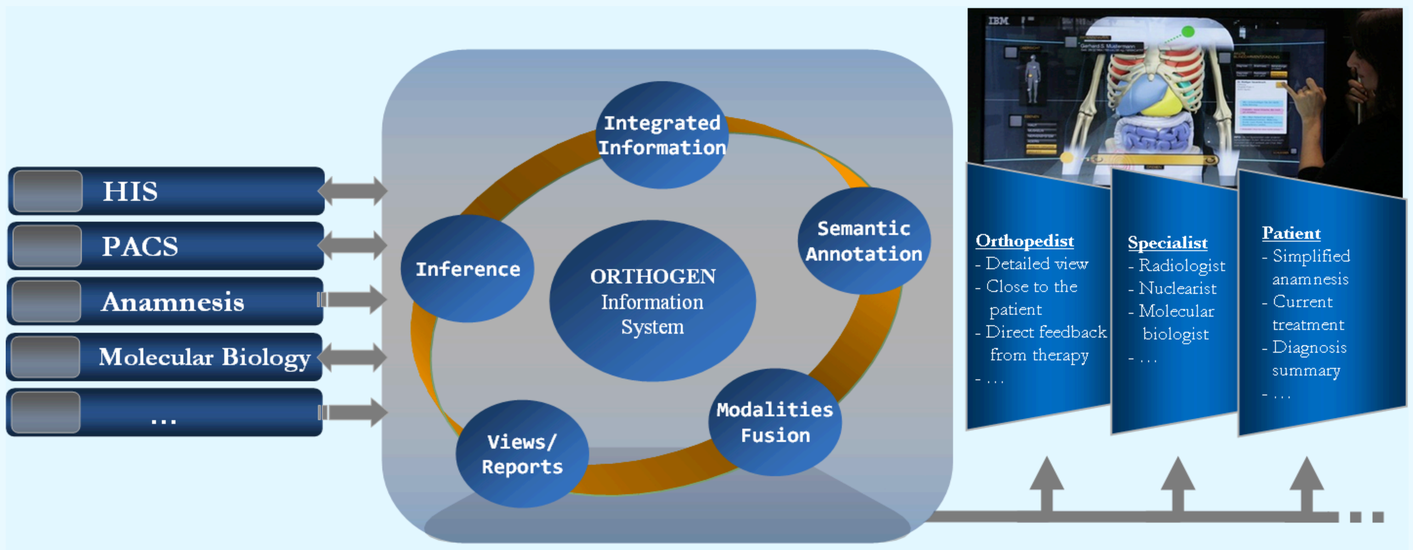


Problem Analysis

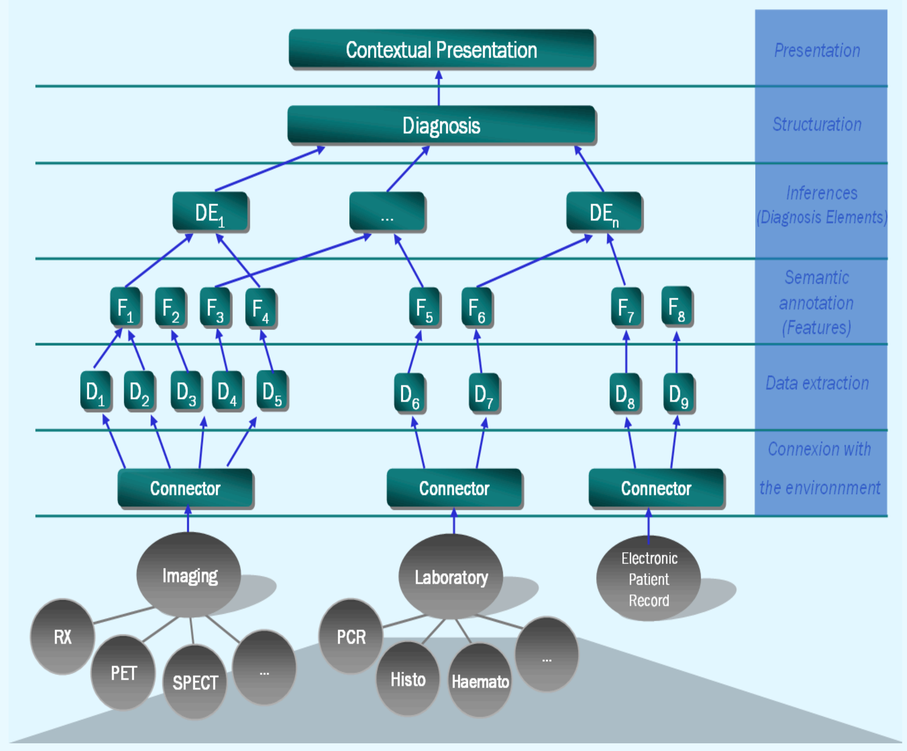
- **Decision Problem (DP)**
  - Making a diagnosis
    - <=> DP (Pattern classification)
      - Features pattern => Pathology
  - Mathematical formalization
    - Pathologies <=> Classes/models
    - Features (functional/descriptive properties)
  - Structuring the Decision Process
    - DP identification (Discriminative features)
    - DP structuration (Business rules)
    - Solution selection (Reasoning)
- **Complex Diagnostic Environment**
  - Heterogenous data
  - Cooperation (different areas of expertise)
  - Iterative process (prospecting, guidelines)
  - Interaction with hospital entities (standards)
- **Constraints**
  - Uncertainty
  - Adaptability

Challenge

Integration System



Abstraction Layers



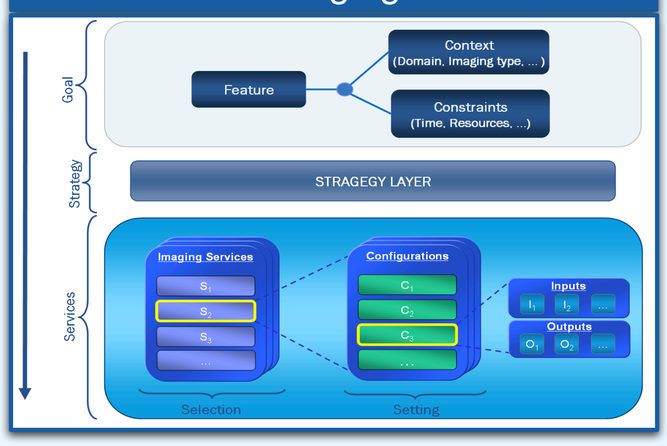
Orthogen Model

Logical View

Markov Logic

Modular Ontologies

Imaging



PCR

Automatic microorganisms identification :

1. REAL-TIME PCR for the amplification of genomic sequences
2. Amplicons hybridization on DNA chips for specific identification